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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 5 : <b>B63B 1/34, 59/04</b>	<b>A1</b>	(11) International Publication Number: <b>WO 93/25432</b> (43) International Publication Date: 23 December 1993 (23.12.93)
(21) International Application Number: PCT/SE93/00504 (22) International Filing Date: 7 June 1993 (07.06.93) (30) Priority data: 9201736-7 5 June 1992 (05.06.92) SE (71) Applicant (for all designated States except US): JURISTBY- RAN INDIREKT AB [SE/SE]; Ingenjörsgatan 5, S-411 19 Göteborg (SE). (72) Inventor; and (75) Inventor/Applicant (for US only) : ALM, Kjell, K. [SE/SE]; Ingenjörsgatan 5, S-411 19 Göteborg (SE). (74) Agent: CLAESSON, Lennart, C.; Patent Ability Lennart Claesson AB, Box 4110, S-175 04 Järfälla (SE).		(81) Designated States: AT, AU, BB, BG, BR, BY, CA, CH, CZ, DE, DK, ES, FI, GB, HU, JP, KP, KR, KZ, LK, LU, MG, MN, MW, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SK, UA, US, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).  Published With international search report. With amended claims and statement. In English translation (filed in Swedish).

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## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<b>(21) International Application Number:</b> PCT/SE93/00504 <b>(22) International Filing Date:</b> 7 June 1993 (07.06.93) <b>(30) Priority data:</b> 9201736-7      5 June 1992 (05.06.92)      SE <b>(71) Applicant (for all designated States except US):</b> JURISTBY- RÅN INDIREKT AB [SE/SE]; Ingenjörsgatan 5, S-411 19 Göteborg (SE). <b>(72) Inventor; and</b> <b>(75) Inventor/Applicant (for US only) :</b> ALM, Kjell, K. [SE/SE]; Ingenjörsgatan 5, S-411 19 Göteborg (SE). <b>(74) Agent:</b> CLAESSION, Lennart, C.; Patent Ability Lennart Claesson AB, Box 4110, S-175 04 Järfälla (SE).		<b>(81) Designated States:</b> AT, AU, BB, BG, BR, BY, CA, CH, CZ, DE, DK, ES, FI, GB, HU, JP, KP, KR, KZ, LK, LU, MG, MN, MW, NL, NO, NZ, PL, PT, RO, RU, SD, SE, SK, UA, US, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report.</i> <i>With amended claims and statement.</i> <i>In English translation (filed in Swedish).</i>
<b>(54) Title:</b> COATING ON MARINE CONSTRUCTIONS  <b>(57) Abstract</b>  The invention relates to vessels and other marine constructions situated in or brought forward in a fluent medium. The invention is characterized in that the marine constructions are provided with fiber flock on surfaces coming in contact with the medium. This will cause a reduced inclination for plants and animals to grow on and damage the construction (anti-fouling) and a reduced friction against the medium when the vessel is moving.		

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Titel:

Coating on marine constructions.

Field of the invention:

- 5 The present invention relates to vessels brought forward in a fluent medium meeting a resistance of flow due to friction against the surrounding medium, and other marine constructions which at least partially reaches under the surface of water. Especially, the invention relates to  
10 coatings below the surface of water for anti-fouling and keeping friction low.

State of the art:

- Vessels of the abovementioned type are floating in or  
15 supported by a surrounding medium both when they are stationary and moving forwards. Vessels also encounter a powerful resistance of flow when driven forwards, the resistance increasing with the square of the speed as it increases. The resistance of flow depends mainly on the  
20 friction against the surrounding medium and the greatest part altogether of the input energy to the vessel is consumed for overcoming this frictional resistance. In order to reduce this resistance of friction and flow, up to now vessels have been made streamlined and the surfaces facing the medium as  
25 even and smooth as possible. One has also tried to paint the surfaces with friction reducing means and used toxic paints for preventing overgrowing and thereby increasing resistance of flow.

- 30 Technical problem:

- Tests to reduce the friction between a vessel in movement and the surrounding medium have so far only been partly successful. It is true that big improvements in this respect has been done during later decades, but it is still a fact  
35 that big amounts of energy in the form of fuel have to be used. This, of course, is a big problem concerning the costs, but at least as big concerning the environment which is polluted by all the exhaust gases.

The solution:

From the above mentioned reasons it has been a longfelt want to be able to reduce overgrowing and the frictional resistance between a vessel in movement and the surrounding medium and according to the present invention I have provided  
5 vessels wholly or partially with fiber flock on areas coming in contact with the medium.

It is advisable to provide hulls with fiber flock up to the  
10 water line. Submarines, which often are driven totally immersed in water should be provided with flock all over the surface. Because of the lower energy consumption the submarine can stay longer under water and it is more silent due to the noise reduction in the flock layer.

15

The technique for providing fiber flock to a surface is well known. It consists of providing an area with an adhesive whereafter electrically charged fibres are caused to land in the adhesive and are fastened in it. The adhesive often is a  
20 two component resin and the fibres usually are synthetic made of polyamide for instance. However, the fibres useful for the present invention are not limited to any special type, also for example coal fibres, glass fibres or similar can be used.

25 According to a preferred embodiment of the present invention a lot of fibres are used, which after electrostatic application to a great extent will be fixed perpendicular to the basis. The density of fibres may be 50-300 fibres per square mm, preferably more than 150 fibres per square mm,  
30 with a fibre thickness less than 0.1 mm, preferably less than 0.05 mm and a length of 0,5-5 mm, preferably less than 3 mm.

Known technology:

The known technology, which is considered closest to the  
35 herein proposed, is shown in EP A2 0 353 095 and JP 57-104 492 (Abstract). These show coatings with a fur surface in order to prevent overgrowth with marine organisms. In the first mentioned publication fur coated sheets are attached on the parts to be protected and the fibres are preferably 10-

30 mm in length in order to sway freely in the water. In the other publication a hull under the water line is coated with a fur or plastic mat with hair or plastic fibres arranged in the direction from the bow of the vessel in order to prevent an increase of the resistance of flow.

The present invention differs essentially from what is thus known in that fiber flock with a high density of thin, short fibres are used and that they are applicated directly in an adhesive on the areas to be coated. No substantial change in the resistance of flow has been registered in spite of the directions of the fibres partially is randomized with most of the fibres directed essentially perpendicular to the basis. On the contrary, a low resistance of flow is maintained with the present invention owing to none or insignificant overgrowth. The surface with fiber flock also has a high durability and noise reducing and insulating qualities.

#### Advantages:

As mentioned above, according to the present invention the advantage is achieved that less energy is required for driving a vessel, which means savings in costs and reduced stress on the environment. When boats and other marine constructions are provided with fibre flock on surfaces under the water line, this will prevent growth of algae and other plants and animals on the surfaces (anti-fouling). Therefore you can give up coating the surfaces with toxic substances such as red lead to avoid such growth. This further strengthens the environment promoting effect of the invention.

The invention is not limited to the embodiments mentioned above. It can be varied in different ways within the scope of the claims.

## CLAIMS

1. Vessel or other marine construction, characterized  
5 in that they are wholly or partially provided with fiber flock on surfaces coming in contact with the water.
2. Marine construction according to claim 1,  
characterized in that the fiber flock consists of  
10 synthetic fibres applicated with electrostatic technique in an adhesive on the surfaces.
3. Marine construction according to claim 2,  
characterized in that the fibres have a length between  
15 0.5 and 5 mm and a density of 50-300 fibres per square mm.
4. Marine construction according to claim 3,  
characterized in that the fibres have a length between  
0.5 and 3 mm and a density of 150-300 fibres per square mm.  
20
5. Vessel or other marine construction according to any of  
claims 1-4, characterized in that the hull of the  
vessel or the marine construction wholly or partially is  
provided with fiber flock to the water line.  
25
6. Marine construction according to any of claims 1-4 in the  
form of a submarine, characterized in that essentially  
all of the hull is provided with fiber flock.
- 30 7. Method of preventing overgrowth on surfaces under the  
water line on vessels and other marine constructions,  
characterized in that the surfaces wholly or partially  
are provided with fiber flock.
- 35 8. Method according to claim 7, characterized in that  
the fiber flock consists of synthetic textile fibres applied  
in an adhesive on the surfaces with an electrostatic  
technology.

9. Method according to claim 8, characterized in that the fibres have a length between 0.5 and 5 mm and a density of 50-300 fibres per square mm.

- 5 10. Method according to claim 9, characterized in that the fibres have a length between 0.5 and 3 mm and a density of 150-300 fibres per square mm.



## AMENDED CLAIMS

[received by the International Bureau on 5 November 1993 (05.11.93);  
original claims 1-10 replaced by amended claims 1-7 (1 page)]

1. Method of preventing overgrowth on surfaces under the  
5 water line on vessels and other marine constructions,  
characterized in that the surfaces wholly or partially  
are provided with fiber flock including synthetic fibres  
applied in an adhesive on the surfaces.
- 10 2. Method according to claim 1, characterized in that  
the fiber flock consists of synthetic textile fibres applied  
in an adhesive on the surfaces with an electrostatic  
technology.
- 15 3. Method according to claim 2, characterized in that  
the fibres have a length between 0.5 and 5 mm and a density  
of 50-300 fibres per square mm.
4. Method according to claim 3, characterized in that  
20 the fibres have a length between 0.5 and 3 mm and a density  
of 150-300 fibres per square mm.
5. Vessel or other marine construction, characterized  
in that it is wholly or partially provided with fiber flock  
25 on surfaces coming in contact with the water according the  
method of any of claims 1-4.
6. Vessel or other marine construction according to claim 5,  
characterized in that the hull of the vessel or the  
30 marine construction wholly or partially is provided with  
fiber flock to the water line.
7. Marine construction according to claim 6 in the form of a  
submarine, characterized in that essentially all of  
35 the hull is provided with fiber flock.

## STATEMENT UNDER ARTICLE 19

A substitute sheet, page 4, with new claims 1-7 are filed herewith.

New claim 1 is equal to former claim 7 and part of claim 8.

New claims 2-4 are equal to former claims 8-10.

New claim 5 is equal to former claim 1 with an added reference to the method of new claims 1-4.

New claims 6 and 7 are equal to former claims 5 and 6, respectively.

Former claims 2-4 are omitted as they are contained in the reference to new claims 1-4 in new claim 5.

All new claims are considered to be patentable. According to the search report no citation of particular relevance to claim 8 was found and new claim 1 contains essential parts of that claim together with the claim it refers to. All other claims are now subordinated to new claim 1 and should therefore also be patentable.

The amendment of the claims will have no impact on the description, but the title might be altered.

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 93/00504

## A. CLASSIFICATION OF SUBJECT MATTER

IPC5: B63B 1/34, B63B 59/04

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC5: B64C, B63B, F15D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB, A, 2068502 (GEORGE APPLGATE), 12 August 1981 (12.08.81), page 1, line 27 - line 30; page 1, line 84 - line 99, figures 4,5	1,2,5,6
Y		3,4
A	--	7-10
X	US, A, 4337716 (HARRIS), 6 July 1982 (06.07.82), column 5, line 36 - line 52, figures 9,10	1,7
A	--	2-6,8-10

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

\* Special categories of cited documents:

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Date of the actual completion of the international search

14 Sept 1993

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**INTERNATIONAL SEARCH REPORT**  
Information on patent family members

26/08/93

International application No.  
PCT/SE 93/00504

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
GB-A- 2068502	12/08/81	NONE	
US-A- 4337716	06/07/82	NONE	
US-A- 1903823	18/04/33	NONE	
US-A- 2322632	22/06/43	NONE	